

ART. II.—A Revision of the Cainozoic Species of *Glycymeris*  
in Southern Australia.

By F. CHAPMAN, A.L.S., and F. A. SINGLETON, M.Sc.

(With Plates I.-IV.)

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Contents.

INTRODUCTION	-	-	-	-	-	-	-	18
SYSTEMATIC DESCRIPTION	-	-	-	-	-	-	-	20
<i>Glycymeris cainozoica</i> , T. Woods sp.	-	-	-	-	-	-	-	20
<i>Glycymeris gunyoungensis</i> , sp. nov.	-	-	-	-	-	-	-	23
<i>Glycymeris maccoyi</i> , Johnston sp.	-	-	-	-	-	-	-	27
<i>Glycymeris lenticularis</i> , Tate sp.	-	-	-	-	-	-	-	31
<i>Glycymeris ornithopetra</i> , sp. nov.	-	-	-	-	-	-	-	32
<i>Glycymeris subtrigonalis</i> , Tate sp.	-	-	-	-	-	-	-	34
<i>Glycymeris maudensis</i> , sp. nov.	-	-	-	-	-	-	-	35
<i>Glycymeris tenuicostata</i> , Reeve sp.	-	-	-	-	-	-	-	36
<i>Glycymeris convexa</i> , Tate sp.	-	-	-	-	-	-	-	37
<i>Glycymeris subradians</i> , Tate	-	-	-	-	-	-	-	39
<i>Glycymeris halli</i> , Pritchard	-	-	-	-	-	-	-	40
<i>Glycymeris halli</i> , var. <i>intermedia</i> , Pritchard	-	-	-	-	-	-	-	41
<i>Glycymeris halli</i> , var. <i>paucicostata</i> , Pritchard	-	-	-	-	-	-	-	42
<i>Glycymeris decurrens</i> , sp. nov.	-	-	-	-	-	-	-	42
<i>Glycymeris planiuscula</i> , sp. nov.	-	-	-	-	-	-	-	43
<i>Glycymeris flabellata</i> , T. Woods sp.	-	-	-	-	-	-	-	45
<i>Glycymeris striatularis</i> , Lamarck sp.	-	-	-	-	-	-	-	46
<i>Glycymeris australis</i> , var. <i>gigantea</i> , Chapman	-	-	-	-	-	-	-	47
RANGE IN TIME OF SPECIES	-	-	-	-	-	-	-	49
SYNOPSIS OF SPECIFIC CHARACTERS	-	-	-	-	-	-	-	50
ACKNOWLEDGMENTS	-	-	-	-	-	-	-	54
BIBLIOGRAPHY	-	-	-	-	-	-	-	54

Introduction.

In the course of a revision of the fossil fauna of Fyansford, of Lower Tertiary age, a problem has arisen regarding the nomenclature of a species of *Glycymeris*. It has seemed desirable, therefore, to consider the Cainozoic forms in some detail, and to attempt to indicate the specific limits and relationships of one of the most variable of our molluscan genera, the modifications of which may be largely due to conditions of environment, as well as to factors of zonal position.

The material here dealt with includes the glycymerids of the collections of the National Museum, Melbourne (including the Dennant coll.); the private collections of Mr. F. A. Cudmore (including part of the T. S. Hall coll.), Mr. W. J. Kimber, and of the authors; in addition to type material from the Tate Museum, Adelaide University, and the Tasmanian Museum, Hobart, together with numerous specimens from various collectors, which are duly recorded in the text. In all, probably not less than two thousand specimens have been examined, a series which has enabled us to deal with the specific limits in a more satisfactory manner than would otherwise have been possible.

In more than one instance forms previously recorded under a single specific name have been split up into two or more species. In such cases it has been deemed prudent to record only those localities from which we have seen specimens, although in the majority of cases the correct specific name may be hazarded with a high degree of probability.

In the systematic section of the paper the species are dealt with primarily in stratigraphic sequence; secondarily in order of original description. In the table of specific characters, however, the species are arranged in approximate order of similitude, in order that differential features may be more readily recognised. The table of stratigraphic ranges of species indicates their approximate relations in time as well as in respect to each horizon, but is not to be taken as necessarily indicating phylogenetic sequence, for which our present state of knowledge is regarded as insufficient.

The paucity of post-Tertiary examples of the genus is noteworthy in such collections as were available to us, but further collecting will doubtless fill in the gaps.

Except for the tentative use of two of the groups suggested by Marwick<sup>1</sup> for the Neozelanic Tertiary species of the genus, no attempt has been made to utilise subgenera, since we understand that Mr. H. J. Finlay, of Dunedin, will shortly publish a communication on the subject. Indeed, although our species may be conveniently allotted to the "*Arinea*" and "*laticostata*" groups of Dr. Marwick, we are doubtful, in view of the occurrence of annectant forms, of their possible subgeneric value. It is noteworthy that there appear to be no Australian representatives of Marwick's third, or "*huttoni*" group, despite its relatively great antiquity in the New Zealand region, where it makes its first appearance in Cretaceous times. We have also refrained, except in one instance, from instituting comparisons between Australian and New Zealand shells, since in many cases affinities are with forms to be described by Finlay in his paper, which we have been allowed to read in manuscript, and the relations of the two faunas are therefore left for him to deal with.

1.—Trans. N.Z. Inst., Vol. LIV., 1923, p. 64.

## Systematic Description.

Genus *Glycymeris*, Da Costa, 1778.

GLYCYMERIS CAINOZOICA, T. Woods sp.

(Pl. I., Figs. 1a, 1b, 2a, 2b, 3, 4; Pl. IV., Figs. 1, 2, 3.)

*Cucullaea cainozoica*, T. Woods, 1877, Pap. Roy. Soc. Tas. for 1876, p. 111.*Pectunculus cainozoicus*, T. Woods sp., Tate, 1886, Trans. Roy. Soc. S. Austr., Vol. VIII., pp. 136, 137, Pl. X., Figs. 8a,b. Johnston, 1888, Geol. Tas., Pl. XXXI., Figs. 13, 13a,b. Harris, 1897, Cat. Tert. Moll. Brit. Mus., Pt. I., Australasia, p. 340.

Description by T. Woods, 1877.—“Shell roundly trigonal, oblique, globose, smooth, faintly and closely marked with radiating ribs and concentric striæ, the latter well defined and somewhat rugose at the margin and sides, umbones very acute and recurved; ligamental area, arched, broad, with six straight grooves on each, which are well defined and overlap each other alternately under the umbo, hinge teeth, 6-7, bent under the hinge and then bicuspidate, muscular impressions lanceolate, well defined, the anterior adductor with a slightly lamellar edge, margin finely pectinated with very distinct crenulations which continue in young shells all round as far as the hinge. Young shells are also more quadrate and have the angular ears slightly developed. Altogether the shell is intermediate between *Cucullæa* (*sic*) and *Pectunculus* and partakes somewhat of the character of both genera.”

Additional Note on T. Woods' Types.—We have been favoured by Mr. Clive E. Lord, Director of the Tasmanian Museum, with an opportunity of examining the type material. This consists of three separate valves, one gerontic and two smaller ephebic examples. The largest specimen, which was indicated by label as the type, agrees in the main with Tenison Woods' description above quoted, and is here regarded as the holotype. The surface ornament is very poorly preserved, and it is evident that Woods' description of it must have been taken from the two smaller but better preserved specimens, which are regarded by us as paratypes. Since the type material has not hitherto been figured, we take the opportunity to figure the holotype and one of the paratypes, and upon them we make the following observations. The sub-acuminate character of the umbonal region is well marked in the holotype, the anterior and posterior angles being steeply truncated, with the longer slope on the posterior. This extreme obliquity appears to be a gerontic character, whilst the sloping shoulders of the holotype are regarded by us as an individual feature and somewhat abnormal in the species. Additional characters seen are the strongly margined rim of the pos-

terior adductor scar, and the distinct, short, rounded sinus. On the cardinal line there are five teeth on the anterior series, and eight on the posterior. The ligamental area shows eight striae in a space of about 2.5 mm.

The shell surface as seen in the paratype figured is marked with fine radii crossing the slightly lamellose growth lines; the radii being in fasciculi of four, separated by a deeper line, thus forming a depressed quadriplicate costa.

Dimensions of Holotype.—Length (ant-post.), 34 mm. Height, 32 mm. Thickness of valve, 11.5 mm.

Observations.—Tate, in 1886 (*loc. supra cit.*), figured as a variety of this species a shell from Muddy Creek, with the comment: "This differs from the type in being more orbicular, less narrowed at the hinge-line—characters very conspicuous in young shells. The variety is hardly separable from *P. pulvinatus*, Lamk., of the Parisian Eocene, which is, however, more gibbous at the umbones, and is equilateral.

Dimensions.—Length, 45; width, 42; thickness through valves, 33 millimetres."

Examples from this locality (Muddy Creek, Lower Beds) show a variation in outline from the orbicular form figured by Tate (*loc. cit.*, Pl. X., Figs. 8a,b.), towards the greater obliquity of the holotype, the sloping shoulders of which we have already indicated as somewhat atypical of the species. This variation may be seen in the series on Tate's original tablet, lent to us from the Adelaide University Geological Department, and we here figure (Pl. I., Figs. 3, 4), in addition to the original of Tate's figure, the adjoining shell as an example of the more oblique form. The dimensions of the shell in the right hand upper corner of the tablet, marked by Tate as the original of his figure, with which it agrees in dimensions and shape, are as follows:—Length (ant-post.), 40 mm.; height, 38 mm.; thickness through valve, 15 mm.; so that a discrepancy exists in respect to the dimensions given by Tate in his description. It may be noted, moreover, that the figure has evidently been reversed in lithographing, since the specimen proves to be a right valve. The corresponding dimensions of the more oblique specimen (right valve), here figured for the first time (Pl. I., Fig. 4), are 46.5 mm., 45 mm., and 16.5 mm.; while those of the largest example known to us from the same locality (in the Dennant collection at the National Museum) are 67 mm., 60 mm., and 24 mm. respectively, thus exhibiting well the increase of obliquity in the extreme stage of geronticism.

The outline and degree of inflation are thus seen to be inconsistent features, and while the Balcombian shells show a tendency towards a planation of the surface ornament, neither character can be regarded as of even subspecific value, and we therefore follow Tate in refraining from the introduction of a varietal name.

Harris (*loc. cit.*) gives a brief description of the species, of which he remarks: "It is closely allied to *P. cor*, Lamarck, and young specimens of that are separated with difficulty from the present species. *P. Cainozoicus*, however, has a relatively longer hinge, the umbones are more elevated and acute, and the depression on either side of the adductor scars is characteristic."

This species name was utilised for Kalimnan shells until 1903, when the latter were separated by Pritchard under the name of *G. halli*, under which species the differential characters are given.

It may be here noted that re-examination of the specimen from Mallee Bore No. 4 at 163'-170', recorded as *G. Cainozoica*, induces us to refer it to *G. halli*, so that the former species is absent in this series of borings.

*G. Cainozoica* appears to be the earliest representative in the Australian Cainozoic succession of the division of the genus recently recognised in the New Zealand Tertiaries by Marwick<sup>2</sup> as the "Axinea group."

Occurrence.—Balcombian (Oligocene): Clifton Bank, Muddy Creek, Victoria (Tate, Dennant, Hall and F.A.S. colls.). Also recorded by Hall and Pritchard from Balcombe Bay.

Janjukian (Miocene): Holotype and paratypes from Table Cape, Tasmania, in the Hobart Museum (also Tate, Hall, and Nat. Mus. colls.); Bird Rock Cliffs, Torquay (Tate and F.A.S. colls.); Shelford (Dennant and J. M. Wilson colls.); Rutledge's, near Geelong (T. S. Hall coll.), Victoria. Adelaide Bore (Tate coll.); Murray River, four miles below Morgan (F. A. Cudmore coll.), South Australia. Also recorded by Johnston, from Flinders Is., Bass Strait; by Tate and Dennant, from Camperdown, Vic., and Aldinga, lower beds, S.A.; by Hall and Pritchard, from Wilkinson's No. 4 locality, Aire Coast; Fishing Point, Aire River; Waurin Ponds; Batesford; Orphanage Hill, Fyansford; and South Yarra, all in Victoria; by Dennant and Clark, from Moitum Creek, Skinner's and Dreir's, on the Mitchell River, V.; by Dennant and Kitson, from Cape Otway, V., Mount Gambier and Lake Alexandrina, S.A. A record from Maude (H. and P.; T. and D.) is presumably referable to *G. maudensis*, sp. nov.

Kalimnan (Lower Pliocene): Nodule bed between Clifton Bank and MacDonald's, Muddy Creek, derived from older series (coll. and pres. Nat. Mus. by F.C.); also Beaumaris, V., form amectant with *G. halli* (Nat. Mus. coll., pres. J. A. Kershaw; also Dennant coll.). Records from Horsham (D. and K.), and Jimmy's Point (H. and P.) may perhaps be based on *G. halli*.

2.—Trans. N.Z. Inst., Vol. LIV., p. 64.

GLYCYMERIS GUNYOUNGENSIS,<sup>3</sup> sp. nov.

(Pl. I., Figs. 5a, 5b, 6; Pl. IV., Fig. 4.)

*Pectunculus laticostatus*, Quoy and Gaimard, McCoy, 1875, Prod. Pal. Vict., dec. II., pp. 26, 27, Pl. XIX., Figs. 12, 13 (non 9, 10, 10a, 11). Tate, 1886, Trans. Roy. Soc. S. Austr., Vol. VIII., p. 137. Harris, 1897, Cat. Tert. Moll. Brit. Mus., Pt. I., Australasia, p. 341.

*Pectunculus M'Coyi*, Johnston, 1888, Geol. Tas., Pl. XXXI., Figs. 1c, 1d, (non 1, 1a, 1b); (non Johnston, 1885).

*Glycymeris maccoyi*, Johnston sp., Chapman and Gabriel, 1914, Proc. Roy. Soc. Vict., Vol. XXVI. (N.S.), Pt. II., pp. 303, 304, Pl. XXIV., Fig. 1 (non 2-5). Chapman, 1916, Rec. Geol. Surv. Vict., Vol. III., Pt. IV., Pl. LXVII., Fig. 1 (non 2-5).

Description of Holotype.—Right valve of an ephebic example; sub-circular, rather depressed; hinge-line moderately short; the dorsal margin at the anterior and posterior ends truncately rounded to meet the more evenly curved ventral margin. In profile the shell is only moderately inflated in the umbonal region, and is more depressed towards the ventral portion. The ornament consists of 33 regularly radiating riblets, somewhat angulate in the neanic stage, becoming more rounded in the ephebic, and depressed and less distinct in the gerontic stage; the interspaces are well-marked but narrow. The shell surface is marked by distinct concentric undulatory lines of growth, which in the ephebic stage become more laminate or squamose. Growth stages not very distinctly defined, in contrast to some other Victorian species, such as *G. convexa* and *G. ornithopetra*. Umbo inconspicuous, slightly opisthogyrate. Hinge-teeth of medium strength, arcuately disposed: about 10 in anterior and 11 in posterior series; individually short and very slightly uncinat. Striated area of limited dimensions, depth slightly under 1 mm. in the holotype, in which space there are about 4 striae. Anterior muscle scar elongate-rhomboidal; posterior scar sub-trapezoidal, and bounded in front by a thin ridge. Inner ventral margin of valve narrow, more or less flat, with 21 inwardly excavated denticles, the points of which coincide with the interradianal grooves of the outer surface, and are the terminations of very faint radial markings on the interior of the shell which are visible only in oblique light.

Dimensions of Holotype. — Length (ant-post.), 22.5 mm. Height, 21.5 mm. Thickness of valve, 5 mm.

Description of Gerontic Form (Paratype).—This shell, a right valve, shows in the ephebic stage an angulation of the radial costation which is entirely lost in the gerontic stage, the ribs becoming uniformly rounded and even depressed. At the same time the concentric laminar growth-lines, which are more strongly

3.—From Gunyoung, a former name of Grice's Creek.

developed in the earlier stages in the intercostal spaces, are in this latest stage strongly developed over the whole surface as a regular frilling.

Dimensions of Paratype.—Length (ant.-post.), 30 mm. Height, 28 mm. Thickness of valve, 7 mm.

Observations.—The earliest reference to the present form was made by McCoy in 1875 (*loc. supra cit.*), when he figured an example (Pl. XIX., Figs. 12, 13) without citing a locality. This specimen is contained in the National Museum collections (Reg. No. 12382), and we are enabled to give the habitat as Balcombe Bay ("Schnapper Point"). It is a right valve in the neanic stage, and as such presents a more circular outline and less prominent umbo than in the ephebic stage. As is the case with many of the figures given in the Prodrusus, the figures on this plate have been reversed in lithographing.

Tate<sup>4</sup> has tentatively included under *P. McCoyi*, Johnston, a Muddy Creek shell which we now refer to the above species. This he describes as "A thin, sub-orbicular, narrowed at the hinge, depressed shell, never exceeding 30 millimetres diameter." In regard to specimens from this locality (Muddy Creek, Lower Beds), we note that they agree in all essential particulars with the examples from the Port Phillip localities of Grice's Creek and Balcombe Bay.

Chapman and Gabriel (*loc. supra cit.*), in discussing the specimens figured by McCoy in the Prodrusus, regarded them as divisible into two mutations of a species referred by them to *Glycimeris mccoysi*, Johnston sp., as follows:—

Form *a*.—A small shell from Grice's Creek. Also larger valves from Corio Bay.

Form *b*.—A large and ponderous shell from Bird Rock.

We now refer the Grice's Creek shell to *G. gunyoungensis*, and describe the Bird Rock form as another new species under the name of *G. ornithopetra*. In regard to the specimens stated by Chapman and Gabriel to be from Corio Bay, we regard them as belonging, not to the Grice's Creek form, but to the Bird Rock (Torquay) species, *G. ornithopetra*. An emendation also becomes necessary as regards the localities of McCoy's figured specimens, as given by Chapman and Gabriel. The small Balcombian example comes, not from Grice's Creek, but from Balcombe Bay, about five miles to the south-south-west. The medium sized shells were stated to be from Corio Bay, on the authority of an old label of the Geological Survey of Victoria. No shells from that locality, comparable with these examples, either in size or other characters, are known to the present authors, whilst the specimens can be exactly matched from Bird Rock Cliffs, and it is suggested that they, in common with the largest specimen figured by McCoy, came from the latter locality. Further confirmation of this view is obtained from the matrix preserved in one

4.—Trans. Roy. Soc. S. Austr., Vol. VIII., 1886, p. 137.

of the shells, which is comparable in character with a bed near the *Glycymeris* band at Bird Rock Cliffs, but is distinct lithologically from anything known at Corio Bay. It is known that many of the old Survey collections from the Geelong district were not localised, and this will account for the error in confusing the Torquay with the Corio Bay collections.

The results of our examination of the specimens figured (without localities) by McCoy on Plate XIX. of the *Prodromus*, are here tabulated:—

Fig. 14 (9 in error on plate). Reg. No. 12385.<sup>5</sup> Left valve. G.S.V. locality Ad 23=Bird Rock Bluff, Torquay, near Geelong. (= *G. ornithopetra*.)

Figs. 10, 11. Reg. Nos. 12383-4. Right and left valves. ? Bird Rock Bluff. (= *G. ornithopetra*.)

Figs. 12, 13. Reg. No. 12382. Right valve. Balcombe Bay, Port Phillip. (= *G. gunyoungensis*.)

It will thus be seen that examples of the present species (*G. gunyoungensis*) have hitherto been recorded as *Pectunculus latirostratus*, Q. and G., and, later, on rejection of the New Zealand species from the Australian fauna, as *G. maccoyi*, Johnston sp. We show subsequently, in dealing with Johnston's species, that this form is restricted to the type locality at Table Cape, Tasmania, and Ooldea, South Australia. Compared with similar-sized specimens of *G. maccoyi*, our species differs in outline, especially in the subtruncation of the hinge-line, and in its very much smaller dimensions in the adult form.

While the majority of the Bird Rock or Spring Creek specimens, hitherto recorded as *G. maccoyi*, Johnston sp., are here regarded as a new species, *G. ornithopetra*, we may note that they are accompanied by occasional diminutive examples of *G. gunyoungensis*, which at this locality and elsewhere has persisted to a later horizon. They may readily be separated from juvenile examples of *G. ornithopetra* by the fewer number of ribs and by the truncation of the dorsal margin, a character which is absent in the neanic stage of the latter species.

Although we include the form of *Glycymeris* found at Orphanage Hill, Fyansford, with the typical *G. gunyoungensis* of Grice's Creek, at the same time we recognise that here (at Fyansford) the valves have a decided tendency to vary in the direction of *G. subtrigonalis*, Tate sp., in regard to the angularity of the cardinal arch, but differ from typical specimens of *G. subtrigonalis* from the River Murray Cliffs in having a thinner shell, as is the case with typical *G. gunyoungensis*. The ancestral characters are so slightly established, however, as to preclude the necessity of even a varietal distinction.

It is evident that *G. subtrigonalis* is the closest ally of the species under consideration, *G. gunyoungensis*. From actual com-

5.—Numbers refer to the Register of the National Museum, Melbourne.

6.—Figures have been reversed in lithographing.



parison of the holotypes of the two species, we note that the latter differs from Tate's species in its thinner and depressed shell with rounded rather than subangulate outline, its gently arcuate and narrow hinge area, and in its more numerous ribs.

An examination of the examples of *Glycymeris* in the Dennant collection of Limestone Creek fossils, tentatively referred by him<sup>7</sup> to *G.* (?) *subtrigonalis*, has led us to refer them to *G. gunyoungensis*, with typical Balcombian examples of which they agree in character of ornament, differing only in their smaller size and greater inflation of the valves. They appear, therefore, to be micromorphic forms of that species, which have reached the gerontic stage before attaining their usual dimensions, as shown by the close concentric ornament and crowding of the growth stages. A recent discovery by one of us (F.A.S.) of fossiliferous Lower Tertiary clays on the Glenelg River, near the junction of Limestone Creek, affords an explanation of the apparent occurrence of this species on so high a horizon as the Werrikooian. We have no doubt that the shells under consideration were derived from these lower beds, with the fauna of which they agree in state of preservation, and it is probable that several of Dennant's records of Lower Tertiary species in the Werrikooian deposits are due to admixture from this source.

Occurrence.—Balcombian (Oligocene): holotype and paratype from Grice's Creek, Frankston, coll. W. Kershaw, in Nat. Mus. (also Cudmore and F.A.S. colls.); Balcombe Bay (Nat. Mus., Cudmore and F.A.S. colls.); Altona Coal Shaft (coll. F.C., in Nat. Mus.); Muddy Creek, lower beds (T. S. Hall, F.A.S., and Nat. Mus. colls.).

Janjukian (Miocene): Bird Rock Cliffs, Torquay (F.C. and F.A.S. colls.); Point Campbell (T. S. Hall coll.); Curlewis (coll. Rev. E. H. Chapple, in Nat. Mus.; also Dennant and F.C. colls.); Corio Bay (F.C. coll.); Orphanage Hill (G.S.V. coll. in Nat. Mus.; also Hall and F.A.S. colls.) and Griffin's, near Fyansford (T.S.H.); Native Hut Creek and Inverleigh (T.S.H.); Murgheboluc (var. annectant with *G. subtrigonalis*, in T. S. Hall coll.); Cape Otway and Gellibrand River (Dennant coll.); Mitchell River at Dreir's (F. A. Cudmore coll.), and Skinner's (Hall and Cudmore colls.); Neumerella, near Orbost (east, coll. F.C. in Nat. Mus.), all in Victoria. Adelaide Bore, South Australia (on Tate's type tablet of *G. lenticularis*).

Janjukian (?): Glenelg River, near Limestone Creek (Dennant coll., Nat. Mus.).

Many records of *G. maccoyi* or *G. laticostata*, from Janjukian localities, are probably referable to the present species, but cannot be allocated in the absence of specimens.

7.—Dennant, 1887, Trans. Roy. Soc. Viet., Vol. XXIII., p. 237.

GLYCYMERIS MACCOYI, Johnston sp.

(Pl. I., Figs. 7a, 7b; Pl. IV., Fig. 5.)

*Pectunculus McCoyi*, Johnston, 1880, Pap. Roy. Soc. Tas. for 1879, p. 41.

*Pectunculus McCoyi*, Johnston, 1885, Pap. Roy. Soc. Tas. for 1884, pp. 199, 200.

*Pectunculus McCoyii*, Johnston, Tate, 1886, Trans. Roy. Soc. S. Austr., Vol. VIII., p. 137.

*Pectunculus laticostatus*, Quoy and Gaimard, Harris, 1897, Cat. Tert. Moll. Brit. Mus., Pt. I., Australasia, p. 341.

*Glycymeris maccoyi*, Johnston sp., Chapman and Gabriel, 1914, Proc. Roy. Soc. Vict., Vol. XXVI. (N.S.), Pt. II., p. 303, Pl. XXIV., Fig. 4 (*non* 1-3, 5). Chapman, 1916, Rec. Geol. Surv. Vict., Vol. III., Pt. IV., Pl. LXVII., Fig. 4 (*non* 1-3, 5).

Description by Johnston, 1885: "Shell orbicular, convex, slightly broader than long, somewhat flattened towards beak, sub-trigonal when young. Surface with 29 to 31 regular radiating convex ribs separated by somewhat narrower interspaces; ribs broadening and becoming less convex towards the margin; marginal extremities rarely obsolete in old specimens; whole surface finely shaply (*sic*) striated concentrically; hinge teeth, generally 10 on each side the three nearest beak smaller and frequently obsolete on one or both sides in old specimens; inside of margin sharply denticulated; ligamental area depressedly triangular with close V shaped striae—in young specimens, 6-7—in specimens of about 2½ inches long, 8-9, the anterior side of beak having generally one stria more than the posterior side.

Mature specimens 2½ to 3 inches long. This shell, hitherto, has erroneously been referred to *P. laticostatus*, Quoy."

Description of Neotype.—Left valve of a gerontic form. Large, stoutly built, moderately convex. Outline in neanic and ephebic stages subcircular, becoming slightly subangulate on the ventral border in the gerontic stage. Hinge-line fairly long; anterior margin rounded, posterior subangularly so. Surface ornamented with 30 rounded ribs, which become flattened in the ephebic and obsolete in the gerontic stage. The ribs are crossed by fine undulate concentric laminae, which in the later stages becomes more salient. Beak small, opisthogyrate, not inflated. Ligamental area fairly long and low, with eight striae in a space of 3 mm. Teeth 8 on each side; anterior geniculate, posterior thick and strongly arched. Anterior adductor scar large, reniform; posterior sub-trigonal and ridged on inner margin. Inner ventral margin of shell planate, with 20 denticulae, interradian in position.

Dimensions of Neotype.—Length (ant.-post.), 57 mm. Height, 54.5 mm. Thickness of valve, 15 mm.

Historical Account.—The identification of this species has occasioned us considerable trouble, and it will be seen that we now

restrict the name to a form which is abundant, so far as is at present known, only at one locality, Table Cape, Tasmania, although occurring also at Ooldea, South Australia. It is convenient to outline at this point the history of Johnston's species name.

In 1880 Johnston remarked that in the Table Cape form there were invariably 29 radial ribs, as against 39 ribs shown in McCoy's Prodrômus figures of a Victorian form identified as *P. laticostatus* by that author (*G. ornithopetra* of the present revision). He goes on to say (*loc. cit.*): "If there is no error in description (in p. 26, Decade II., Geol. Surv. of Vic.), and if the difference is a permanent and specific one, I would propose the name *Pectunculus McCoyi*, for the Table Cape variety. In all other respects it answers Quoy and Gaimard's description." Johnston also states that he has a specimen from Schnapper Point, showing 29 ribs. This locality is identical with Balcombe Bay, the shells from which we refer to *G. gunyoungensis*.

In 1885 Johnston stated that he had compared Recent examples of *P. laticostatus* from New Zealand, with the Table Cape shell, of which he furnished the full description quoted above. He regarded the Recent *P. flabellata*, T. Woods, of the Tasmanian coast, as a closer ally of the Table Cape fossil, and remarked of *P. laticostatus* (*op. cit.*, p. 200): "The latter differs from *P. McCoyi* in being much more solid, and in having invariably 10 more ribs; the length also, generally exceeds the breadth and the convexity towards margin. With *P. flabellata*, Tenison Woods, it differs in being less solid and in having invariably 7 more ribs; *P. flabellata* having invariably 24. The teeth on the latter are generally 10 as in *P. McCoyi*, and in this respect and in ligamental area show a closer correspondence with the latter than with *P. laticostatus*. *P. flabellata*, in Tasmania, moreover, is invariably exactly as broad as it is long. It would appear therefore that the characteristic shell of Table Cape is not identical with living species, and that it seems to be an intermediate form between *P. flabellata*, Tenison Woods, and *P. laticostatus*, Quoy, although showing a closer alliance with the former."

In the same year Tate,<sup>8</sup> in the course of a critical examination of Table Cape molluscan species alleged to have living representatives, made the following observations under the name of *Pectunculus laticostatus*: "I do not acquiesce in Mr. R. M. Johnston's rejection of the above name for the species so common in the Table Cape deposits, which he names *P. McCoyi*. (Proc. Roy. Soc., Tasmania, for 1879, p. 41.) An allied species is plentiful in the River Murray Cliffs, near Morgan, but it has more resemblance to the Australian species, *P. flabellatus* of Tenison Woods than to the New Zealand *P. laticostatus*."

The Murray River species, to which Tate refers, was afterwards described by him as *P. subtrigonalis*.

8.—Tate, 1885, Pap. Roy. Soc. Tas. for 1884, p. 213.

This view was evidently soon reversed by Tate, for Johnston,<sup>9</sup> in a paper communicated to the Royal Society of Tasmania at its next meeting, states that Tate concurs with his determination in respect of *P. McCoyi*.

In the following year, 1886, Tate admitted both Quoy and Gaimard's and Johnston's species names, referring to *P. laticostatus* (?) shells from Bird Rock and Schnapper Point, and to *P. McCoyii* the Table Cape shells, as well as examples from Muddy Creek and Schnapper Point (regarded in this revision as *G. gunyoungeensis*). An additional locality for Johnston's species, accepted by Tate on the former author's record of the previous year, was Cape Schanck, Victoria. While a fossiliferous Batesfordian (Janjukian) limestone has recently been recorded<sup>10</sup> from near Cape Schanck, this is certainly not the locality referred to by Johnston, and the present authors suggest that that author meant the well-known outcrop at Balcombe Bay, near Mornington, some 20 miles to the north, since the term Cape Schanck Peninsula was used in the early days to embrace the whole of this area.

In our observations on an allied species, *G. ornithopetra*, which accompanies *G. maccoyi* at Table Cape, we show that Johnston's figures in the Geology of Tasmania, 1888, Pl. XXXI., Figs. 1, 1a-d, purporting to represent the latter species, do not do so, but belong to other and distinct forms.

In 1896 Pritchard,<sup>11</sup> in the course of a revision of the Table Cape fauna, included *P. maccoyii*, Johnston, in the synonymy of *P. laticostatus*, Q. and G., under which name he placed the Table Cape examples.

In the same year Tate and Dennant<sup>12</sup> remarked: "*Pectunculus laticostatus*, Q. and G., so-called, of the Eocenes of Tasmania and Southern Australia, is, in our judgment, a distinct species, and should be quoted as *P. McCoyii*, Johnston, though the differential characters relied upon by its author are based upon misconception," although earlier in the same paper (*op. cit.*, p. 133) they had recorded, with a query, *Pectunculus laticostatus*, Q. and G., in a list of Table Cape fossils, quoting *P. McCoyii*, Johnston, as a synonym.

Harris, in 1897, utilised Quoy and Gaimard's name, and stated (*loc. cit.*): "Comparison of authenticated specimens of *P. maccoyi*, Johnston, with the living *P. laticostatus*, enables the writer to state, definitely, that they are synonymous." Judging from the localities given by Harris, that author has included at least two other Australian Tertiary species under the name of the New Zealand form.

We refer to *G. maccoyi*, Johnston sp., the Table Cape shell figured under that name by Chapman and Gabriel in 1914 (*op.*

9.—*Op. cit.*, p. 220.

10.—Chapman, 1914, Rec. Geol. Surv. Vict., Vol. III., Pt. III., pp. 318, 319.

11.—Proc. Roy. Soc. Vict., Vol. VIII. (N.S.), pp. 130, 131.

12.—Trans. Roy. Soc. S. Austr., Vol. XX., Pt. I., p. 147.

*cit.*, Pl. XXIV., Fig. 4), and reprinted by the former in 1916 (*op. cit.*, Pl. LXVII., Fig. 4), and these figures (of the same shell) are the only ones referable to Johnston's species, as here defined, hitherto published.

Chapman and Gabriel also stated that a similar, but smaller, form occurred at Mornington, Muddy Creek (lower beds), and Corio Bay, but specimens from these localities are here referred to *G. gunyoungensis*. They further remark (*op. cit.*, p. 304) that typical *G. maccoyi* at Table Cape is accompanied by shells comparable with the Bird Rock form figured by McCoy as *P. laticostatus*, Q. and G., and referred by them to *G. maccoyi*, mutation *b* (*G. ornithopetra* of the present revision).

Finally, in 1919, W. L. May<sup>13</sup> listed *G. laticostatus*, Q. and G., in a census of the Table Cape mollusca, but in a personal communication to one of us (F.C.)<sup>14</sup> he has withdrawn the identification.

Observations.—Study of a series of Table Cape specimens collected by Mr. F. A. Cudmore has shown that examples agreeing with R. M. Johnston's original description are separable from the more numerous costated form herein described as *G. ornithopetra*, under which latter species the differential characters are given. An examination of the type of Johnston's species was, therefore, desirable, and application was made for it to Mr. Clive Lord, Director of the Tasmanian Museum, Hobart, which contains the collections of the late R. M. Johnston. A search by Messrs. Lord and May proved unsuccessful, and it is probable that no primary type was designated by Johnston. We have therefore selected as neotype of *Glycymeris maccoyi*, Johnston sp., a gerontic example collected by Mr. F. A. Cudmore, from the same locality and horizon ("Crassatella Bed"), as Johnston's specimens, and give a description of it above.

In some diminutive shells from this locality the number of ribs is not more than 17-21, while the outline tends towards the sub-trigonal. After comparison with Torquay examples referred by us to *G. gunyoungensis*, we have decided to refer these Table Cape shells to the juvenile stage of *G. maccoyi*. This species, together with the allied *G. ornithopetra*, appears at this locality to have been in a somewhat unstable condition as to outline and also degree of inflation, since inflated *G. maccoyi* and depressed *G. ornithopetra* are occasionally met with. These variants, however, group themselves around two types, to which we apply the above names. After careful consideration it does not appear desirable to split the forms still further, on the one hand, nor, on the other, to regard the Bird Rock type (*G. ornithopetra*) as merely a variant of Johnston's species.

Occurrence.—Janjukian (Miocene): neotype (coll. F. A. Cudmore and pres. to Nat. Mus.), and other examples from lower bed at Table Cape, Tasmania (Cudmore, Hall and Nat. Mus.

13.—Pap. Roy. Soc. Tas. for 1918, 1919, p. 103.

14.—*In litteris*, March, 1924.

(colls.); upper beds at same locality (Cudmore coll.). Ooldea, South Australia (mould, Nat. Mus. coll., pres. F. A. Cudmore).

Many records under this name are doubtless referable to other species; those from the Kalimnan being either *G. convexa* or *G. planiuscula*.

GLYCYMERIS LENTICULARIS, Tate sp.

(Pl. I., Figs. 8a, 8b; Pl. IV., Fig. 6.)

*Pectunculus lenticularis*, Tate, 1886, Trans. Roy. Soc. S. Austr., Vol. VIII., p. 138, Pl. XI., Fig. 1.

Description by Tate, 1886: "Shell rather thin, orbicular, but slightly transverse, depressed, equilateral; radiately ribbed. Ribs numerous (more than 40), very fine, rounded, narrower than, or about as wide as, the interspaces, crossed all over with fine concentric wavy lines. Inner margin of valves narrowly toothed; umbones very small, approximate; ligamental area very small, cardinal teeth 11 on each side.

Dimensions.—Length, 31; width, 29; greatest thickness through both valves, at about one-third of the distance from the front, 12 millimetres."

Note on Tate's Metatypes.—The original tablet, which has been lent to us from the Adelaide University Museum, shows a series of eleven examples, of which the two uppermost specimens (a pair), although not marked as types, undoubtedly formed the basis of Tate's description. Since the figures of the other species of *Glycymeris* in Tate's paper were reversed by the artist, we suspect that the figure given, which represents a left valve, was taken from the right valve on the left hand upper corner of the tablet, with which the figure otherwise agrees.

The two largest examples (Pl. I., Figs. 8a,b) are right and left valves, respectively, of a single pair, which are here regarded as cotypes, since in his original diagnosis Tate refers to "valves" and gives their united thickness. The coarser ribbing and post-dorsal subtruncation of the hinge line in certain of the specimens induces us to refer them to *G. gunyoungensis*, and in these particular examples, moreover, the number of ribs falls well below the minimum of 40 given by Tate. Our interpretation of the series on Tate's original tablet is set out as follows, taking the specimens in each row from left to right:—

TOP ROW.

*G. lenticularis*. Right valve of gerontic example, with 50 ribs. Cotype and probably Tate's figured specimen.

*G. lenticularis*. Left valve of gerontic example, with 50 ribs. Cotype and opposite valve to above.

## MIDDLE ROW.

- G. gunyoungensis*. Right valve of ephebic example, with 34 ribs.  
*G. lenticularis*. Right valve (internal aspect) of ephebic example, with about 44 ribs.  
*G. lenticularis*. Right (?) valve of ephebic example, having post-dorsal margin imperfect, with 42 ribs.

## BOTTOM ROW.

- G. lenticularis*. Left (?) valve of ephebic example, with 44 ribs.  
*G. gunyoungensis*. Neanic examples, with 29, 28, 22 and 26 ribs respectively.  
*G. lenticularis*. Neanic example, with 42 ribs.

Observations.—The depressed character of the present form is shared by the later species, *G. planiuscula*, from which it can be at once distinguished by its shorter hinge-line and greater number of ribs. From immature examples of *G. ornithopetra*, which species attains a much greater size in the adult stage, it differs in being more depressed, with greater proportionate length, more numerous ribs, less sulcated interspaces, and shorter hinge-line.

The closest ally of *G. lenticularis*, however, is probably *G. gunyoungensis*, a species to which we have above referred certain of the series of specimens on Tate's original tablet of *G. lenticularis*. The present species may be distinguished by its longer hinge-line and more rounded dorsal margin, and its more numerous and smoother ribs, which are less tegulate or scaly than in *G. gunyoungensis*.

Occurrence.—Janjukian (Miocene); Two cotypes and other specimens from the Adelaide Bore, South Australia, in the Tate coll., Adelaide University Geological Department; also lower beds at Aldinga (W. J. Kimber coll.), in the same State.

## GLYCYMERIS ORNITHOPETRA, sp. nov.

(Pl. II., Figs. 9a, 9b; Pl. IV., Fig. 7.)

*Pectunculus laticostatus*, Quoy and Gaimard, McCoy, 1875, Prod. Pal. Vict. dec. II., pp. 26, 27, Pl. XIX., Figs. 10, 10a, 11, 14 (9 in error on plate), (*non* 12, 13). Tate, 1886, Trans. Roy. Soc. S. Austr., Vol. VIII., p. 137.

*Pectunculus M'Coyi*, Johnston, 1888, Geol. Tas., Pl. XXXI., Figs. 1, 1a, 1b (*non* 1c, 1d); (*non* Johnston, 1885).

*Glycymeris maccoyi*, Johnston sp., Chapman and Gabriel, 1914, Proc. Roy. Soc. Vict., Vol. XXVI. (N.S.), Pt. II., pp. 303, 304, Pl. XXIV., Figs. 2, 3 (*non* 1, 4, 5). Chapman, 1916, Rec. Geol. Surv. Vict., Vol. III., Pt. IV., Pl. LXVII., Figs. 2, 3 (*non* 1, 4, 5).

Description of Holotype.—The internal aspect of this has already been figured by Chapman and Gabriel, 1914, Pl. XXIV., Fig. 3, and by the former, 1916, Pl. LXVII., Fig. 3.

Right valve; large, strongly convex and deep at the umbo, stoutly built; outline in the neanic and ephebic stages sub-circular, slightly longer than high; in the present gerontic stage it becomes irregularly sub-ovate, with the major diameter dorso-ventral, but somewhat obliquely inclined towards the rear, the ventral border tending to become subangulated at the end of this major axis; anterior margin gently rounded; posterior margin in the gerontic stage definitely angulated where the truncated post-dorsal line meets the ventral border; this angulation increases with age. Surface radially ornamented with 40 subangular to rounded ribs, stronger and thicker on the anterior than on the posterior, and curving slightly posteriorly; ribs in neanic stage more angular than in the ephebic, becoming obsolescent in the gerontic stage. Interspaces between ribs well defined in the pre-gerontic stages, and relatively one-third the space of a rib. Growth-lines very fine, extending above the surface, interradially, as squamose laminae. Growth stages well marked by deeper lines of growth, which cross the entire surface as undulate laminae; 18 in the holotype. Beak opisthogyrate, comparatively small. Hinge-teeth strong, largely encroached upon by area, leaving about 8 teeth on each side; anterior series elongate and uncinata, posterior series strongly arched. Ligamental area short and high; finely striate, in the present example with 10 striae in a space of 4.4 mm. Anterior adductor scar subtrigonal; posterior obovate, ridged on anterior margin, Inner ventral margin subplanate, with about 28 elevated denticulae corresponding to the external interradiial spaces, distinct ventrally, but becoming obsolete towards anterior and posterior.

Dimensions of Holotype.—Length (ant.-post.), 55 mm. Height, 57.5 mm. Thickness of valve, 19.5 mm.

Observations.—This Bird Rock (Torquay) species is clearly an ancestral form related to *G. laticostata*, Q. and *G. sp.*, a Pliocene (Wanganuian) and Recent species in New Zealand, from which it differs, as already pointed out by Chapman and Gabriel (*loc. supra cit.*), in its longer shell and more finely striated ligamental area. In this last character it resembles *G. chambersi*, Marshall,<sup>15</sup> of the Tertiary of Campbell Island, the type material of which species we have been enabled to examine through the good offices of Mr. H. J. Finlay and Professor W. N. Benson. From this species the Australian form differs in its more numerous ribs (40 as against 34 in the respective type specimens), deeper valve, less numerous growth stages (in the neanic stages of both, 3 as against 12), and narrower ligamental area.

15.—*Glycymeris chambersi*, Marshall, 1909, Subantarctic Islands of New Zealand, Vol. II., p. 701. *Glycymeris chambersi*, Marshall, Marwick, 1923, Trans. N.Z. Inst., Vol. LIV., p. 67, Pl. I., Fig. 7.



Hitherto it has been confused with *G. maccoyi*, Johnston, from the Janjukian of Table Cape, Tasmania, from which we note the following points of difference. In *G. ornithopetra* the valves are deeper and the hinge-line shorter, while the ventral border is sub-angularly rounded in the gerontic stage, whereas in *G. maccoyi* it is more evenly rounded. The ribs are more numerous in *G. ornithopetra*, averaging 39 to 40 against 29 to 31 in Johnston's species, and the interspaces are narrower.

Occurrence.—Janjukian (Miocene): abundant at Bird Rock Cliffs, Torquay (=Spring Creek beds), holotype coll. by R. Daintree, in Geol. Surv. Vict. coll., Nat. Mus. (also Cudmore, Hall, F.C., and F.A.S. colls.); Waurm Ponds (Nat. Mus. coll., "pres. J. McKenna," ex. Mortlake Mus.), Victoria. Aldinga, lower beds (W. J. Kimber coll.); Point Turton, Yorke's Peninsula (moulds, F.A.S. coll.); Ooldea (mould, Nat. Mus. coll., pres. F. A. Cudmore), South Australia. Table Cape, Tasmania, upper and lower beds (F. A. Cudmore coll.).

GLYCYMERIS SUBTRIGONALIS, Tate sp.

(Pl. II., Figs. 10, 11, 12; Pl. IV., Fig. 8.)

*Pectunculus subtrigonalis*, Tate, 1886, Trans. Roy. Soc. S. Austr., Vol. VIII., p. 137, Pl. XI., Figs. 6a, b. Harris, 1897, Cat. Tert. Moll. Brit. Mus., Pt. I., Australasia, pp. 340, 341.

Description by Tate, 1886: "Shell solid, somewhat sub-trigonal, sub-equilateral, oblique, slightly produced posteriorly, moderately convex, radiately ribbed; ribs about 29, rounded, separated by flat narrower interspaces, the whole surface crossed by regular, sub-distant, subimbricating lamellæ, and a few folds of growth; umbones small, approximate; hinge line very short, ligamental area small; cardinal teeth eight in front and seven behind the edentulous centre; internal margin of valves strongly crenate.

This species is conspicuous by its narrow hinge line, the valves attaining the greatest transverse diameter at about four-sevenths the distance from the umbo to the front.

Dimensions.—Length, 32; width, 31; thickness through both valves, 19 millimetres."

Note on Tate's Metatypes.—The tablet of specimens selected by Tate, and lent to us from the Adelaide University Museum, comprises 12 examples, of which the second from the right in the top row, is marked by Tate as the figured specimen. This shell, regarded by us as the holotype, represents the rather oblique shell of the gerontic stage. We here re-figure this and the adjoining specimen on the left, which is a more average example, and is less markedly angular on the dorsal margin. The sub-trigonal character of outline seems to make its appearance after the neanic stage, and becomes accentuated in the gerontic. Here again a discrepancy occurs in respect to dimensions. Those of Tate's

figured specimen (holotype) are:—Length, (ant.-post.), 30 mm.; height, 29 mm.; thickness through valve, 8 mm.; with which Chidley's figures agree well. The corresponding dimensions of the shell to the left, figured by us, are 27 mm., 25.5 mm., and 7.5 mm.; while that on the opposite side measures 32 mm. (damaged) by 31.5 mm. by 10 mm., and may possibly be the one measured by Tate. All three shells are left valves, Tate's figures by Chidley having been reversed.

Observations.—The alliance of *G. subtrigonalis* with *G. gunyoungensis* is perhaps the nearest of any of the species dealt with, and separation of juvenile forms is difficult. Differential characters of these two species in the adult form are dealt with in the remarks upon *G. gunyoungensis*.

The specimens recorded under this name from the Kalimnan of Muddy Creek are later described as *G. decurrens*, while a doubtful record from the Werrikooian of the Glenelg River has already been shown to be referable to *G. gunyoungensis* and to belong to an earlier horizon.

We illustrate the internal aspect from a topotype (right valve) collected by F. A. Cudmore, and presented by him to the National Museum. The dimensions of this shell are: Length, 29.5 mm.; height, 28.5 mm.; thickness, 9 mm.

Occurrence.—Janjukian (Miocene): abundant on Murray River, four miles below Morgan, South Australia, holotype in Tate Mus., Adelaide University (also Cudmore and Dennant colls., and Nat. Mus., pres. F. A. Cudmore). Also form annexant with *G. gunyoungensis* from Shelford (Dennant coll.), and Meredith (cf. *subtrigonalis*, Nat. Mus. coll., pres. J. A. Kershaw).

Kalimnan records of this species are probably referable to *G. decurrens*, sp. nov.

#### GLYCYMERIS MAUDENSIS, sp. nov.

(Pl. II., Figs. 13a, 13b; Pl. IV., Fig. 9.)

Description of Holotype.—Left valve of an epeheic example, differing from similar sized specimens of its near relative, *G. cainozoica*, in the incrassate shell and more subtrigonal outline. Umbonal region prominent, subacuminate, and not strongly incurved as in *G. cainozoica*; umbonal shoulders sloping, with the posterior steeper than the anterior. Ribs depressed, about 28 in number, with intercostal linear sulci; costation conspicuous over larger portion of valve, but becoming obliterated by concentric growth frills in senescent stage. Cardinal area more massive than in *G. cainozoica*, with about 8 teeth on each side; denticulation of ventral edge of valve correspondingly thick.

Dimensions of Holotype.—Length (ant.-post.), 29 mm.; height, 28 mm.; thickness of valve, 10 mm.

Observations.—The principal points of difference between *G. maudensis* and *G. cainozoica*, which at first we had been inclined to regard as variety and species, are incorporated in the above

diagnosis. There are, however, so many differential points that a further study has convinced us that it is better to regard it as a well-defined species.

Occurrence.—Janjukian (Miocene): holotype and a second example from Maude (lower beds), Moorabool River, Victoria, in Dennant coll., Nat. Museum.

GLYCYMERIS TENUICOSTATA, Reeve sp.

(Pl. II., Figs. 14, 15a, 15b; Pl. IV., Figs. 10, 11.)

*Pectunculus tenuicostatus*, Reeve, 1843, Proc. Zool. Soc. Lond., p. 80. *Idem*, 1843, Conch. Icon., Vol. I., Pl. VI., Fig. 35. Lamy, 1912, Journ. de Conch., Vol. LIX., pp. 105, 106, Pl. III., Fig. 3.

*Glycymeris tenuicostata*, Reeve, Gatliff and Gabriel, 1910, Proc. Roy. Soc. Vict., Vol. XXIII. (N.S.), Pt. I., p. 97.

Description of 1st Plesiotype (Janjukian).—Right valve, sub-circular in outline, moderately inflated, with subacute umbo. Surface ornamented with about 40 riblets, which towards the median area are alternately large and small; these are traversed by fine thread-like lines of growth, which become beaded where they cross the radial costæ; growth stages few and inconspicuous. Hinge area narrow, but slightly stouter than in Recent examples of the same size; hinge teeth slender, slightly arcuate, 11 and 10 in anterior and posterior series. Denticulæ of inner ventral margin somewhat stronger than in corresponding living forms.

Dimensions of 1st Plesiotype.—Length (ant.-post.), 14 mm.; height, 13 mm.; thickness of valve, 4.5 mm.

Description of 2nd Plesiotype (Werrickooian).—Left valve of a gerontic example; subangularly rounded, moderately inflated and with subacute umbo. Radial ornament consisting of about 44 riblets, of which the larger in the median area are carinate and more pronounced than in the Janjukian plesiotype, the secondary riblets becoming more prominent towards both extremities. The concentric ornament is virtually restricted to the intercostal spaces, where it gives rise to an incipient tegulation. Cardinal area broad; teeth straight to slightly arcuate, especially on anterior, numbering 12 and 11 on anterior and posterior series. Denticulation of ventral edge strongly marked.

Dimensions of 2nd Plesiotype.—Length (ant.-post.), 29 mm.; height, 26.5 mm.; thickness of valve, 8.5 mm.

Observations.—Examples in the Dennant coll. from Skinner's, Mitchell River, one of which we describe as plesiotype, agree in essentials with Recent shells from Cape Pillar and Oyster Bay, Tasmania, and the range of the species from Janjukian to the present day is noteworthy. One Kalimnan record is at present known to us, while it is of rare occurrence in the Werrickooian shell beds of the Glenieig River, being represented by a worn

example in the Dennant coll., and by a well-preserved shell collected by one of us (F.A.S.), here taken as a second plesiotype. These latter examples attain much larger dimensions than the Janjukian forms, while the costate ornament is more strongly developed and shows a distinct carination, but all these features are seen in a Recent Australian shell, without precise locality, in the National Museum collection.

Occurrence.—Janjukian (Miocene): plesiotype and other specimens from Skinner's, on Mitchell River, near Bairnsdale, Victoria, in Dennant coll. Nat. Museum.

Kalimnan (Lower Pliocene): Beaumaris, near Cheltenham (Dennant coll.).

Werrickooian (Upper Pliocene): Glenelg River, near Limestone Creek, Victoria, plesiotype coll. and pres. to Nat. Mus. by F. A. Singleton, also Dennant coll.

Recent: not uncommon in Tasmanian waters; also eastern coast line of Australia from Victoria to Queensland.

GLYCYMERIS CONVEXA, Tate \* sp.

(Pl. II., Figs. 16a, 16b, 17, 18, 19, 20; Pl. IV., Figs. 12, 13.)

*Pectunculus convexus*, Tate, 1886, Trans. Roy. Soc. S. Austr., Vol. VIII., p. 138, Pl. XI., Figs., 7a,b. Harris, 1897, Cat. Tert. Moll. Brit. Mus., Pt. I., Australasia, p. 342.

*Glycymeris maccoyi*, Johnston sp., Chapman and Gabriel, 1914, Proc. Roy. Soc. Vict., Vol. XXVI. (N.S.), Pt. II., p. 304, Pl. XXIV., Fig. 5 (non 1-4). Chapman, 1916, Rec. Geol. Surv. Vict., Vol. III., Pt. IV., Pl. LXVII., Fig. 5 (non 1-4).

Description by Tate, 1886: "Shell solid. Orbicular, but slightly transverse, tumid; sub-equilateral, umbones approximate, radiately ribbed. Ribs about 24, rounded, elevated, interspaces concave, wider than the ribs, crossed all over with thick concentric wavy laminæ becoming finer towards the front. Inner margin of valves strongly crenate. Cardinal teeth about ten on each side.

Dimensions.—Length, 31 mm.; width, 33 mm.; thickness through both valves, 22 millimetres.

This species has some resemblance to the recent *P. flabellatus*, T. Woods, but is more inflated and with wider interspaces between the ribs."

Note on Tate's Metatypes:—The tablet in the Tate Museum, University of Adelaide, carries 16 specimens, the top row of four being gerontic, the middle row of five neanic, and the bottom row of seven practically in the ephebic stage. The second from the right in the top row, indicated by Tate as the figured specimen, and here taken as holotype, is a left valve in the gerontic stage, damaged on the ventral margin but restored in Chidley's drawing, which by the way was reversed. In addition to re-figuring the

holotype in external and umbonal aspects, we give figures of the umbonal aspect of the more convex form adjoining on the left, as well as the internal aspect of the specimen to the right; all three being left valves. The variation in convexity is well shown by their respective length, height, and thickness, which are 34, 32 and 12.5 mm.; 30, 29, and 15 mm.; and 30, 29.5 and 10 mm. We also figure (Pl. II., Fig. 19) one of Tate's juvenile examples which we regard as typical.

Observations.—Harris, in his description of the Muddy Creek specimens, refers to the small ligamental area and the strongly crenulated inner margin of the valve (*loc. supra cit.*, p. 342). The same author, in making a comparison with *Glycymeris flabellata*, T. Woods sp. (a Werrikoonian and Recent species), adds to Tate's points of difference the observation that the ligamental area is much smaller in Tenison Woods' species.

The typical *G. convexa*, with its 24 ribs and strongly arched valves, appears in the neanic stage to run on the one hand into *G. planiuscula* by the flattening of the shell and the straightening of the hinge-line; whilst on the other there are passage forms into *G. decurrens*, in which the number of ribs, however, is about 30, as in *G. planiuscula*, the ribs are closer together, and the dorsal line has sloping shoulders, thus making the umbo more salient, and the outline generally subtrigonal. In adult specimens there is no difficulty in separating these three related species.

The diminutive shell from the Kalimnan of Muddy Creek figured by Chapman and Gabriel (*loc. cit.*) as *G. maccoyi*, is regarded by us as a juvenile example of *G. convexa*, in which the number of ribs is rather greater, and the degree of inflation somewhat less, than in typical examples of this species. It is here re-figured (Pl. II., Fig. 20) for comparison with the more typical juvenile shell from Tate's tablet. With one exception, referred to *G. planiuscula*, the records of *G. maccoyi* from the Mallee Bores are here attributed to *G. convexa*.

Shells from the upper beds of the Adelaide Tertiary basin, as cut in the Abattoirs and other bores, show a certain amount of variation from the Muddy Creek topotypes, the South Australian examples being in general more depressed and with distinctly flattened ribs. The concentric ornament is also more developed as a series of undulose growth lines which cross the quadrately depressed ribs. This form makes a decided approach to a variant of *G. flabellata* found in South Australian waters (*vide postea*), and it may be noted that this intermediate form occurs in beds which were regarded by Tate as intermediate in age between those of Muddy Creek (Kalimnan) and the Limestone Creek shell beds (Werrikoonian), although they are here classed with the former.

Occurrence.—Janjukian (?) (Miocene, probably high in series): Rose Hill, near Bairnsdale, Victoria (mould, coll. F. A.

Cudmore). The record by Tate and Dennant of this species from Camperdown requires confirmation before acceptance.

Kalimnan (Lower Pliocene): holotype from upper beds, Muddy Creek, in Tate coll., Adelaide University (also T. S. Hall and F.A.S. colls.); Forsyth's, Grange Burn (Dennant, Hall, F.C. and F.A.S. colls.); Beaumaris (Cudmore coll.); Jimmy's Point, Kalinna (doubtful identification, Dennant coll.); Mallee Bores, No. 5, at 162'-163'; No. 8, at 165'-180' (juv.), 199'-204' (frag.), and 204'-210' (juv.); No. 9, at 254'-256' (juv.), and in a mixed Kalimnan and Janjukian fauna at 235' in the Paynesville Bore, in Nat. Mus. coll., Victoria. Mindarie (W. J. Kimber coll.); Abattoirs Bore (Kimber and Cudmore colls.), Adelaide, South Australia. This species is also listed by Tate from Tareena, N.S.W., and from the upper series (oyster beds), at North-west bend on the River Murray, Dry Creek Bore (var.) and at Aldinga (upper beds), and Hallett's Cove, South Australia; and by Dennant, from Horsham, Victoria.

GLYCYMERIS SUBRADIANS, Tate.

(Pl. III., Figs. 21, 22; Pl. IV., Fig. 14.)

*Glycymeris subradians*, Tate, in Basedow, 1902, Trans. Roy. Soc. S. Austr., Vol. XXVI., Pt. II., p. 132. Chapman, 1915, Geol. Surv. S. Austr., Bull. No. 4, p. 48.

Description in Basedow, 1902.—“This species is of the same general outline as *G. radians*, Lk., but differs by being flatter and having its radial ribs more acutely elevated, the interspaces being as wide. The radial ornamentation, moreover, is obsolete on the lateral slopes.”

Observations.—This species has not been figured hitherto, but one of us has amplified the brief original diagnosis by the following description (Chapman, *loc. cit.*) of a specimen from Hallett's Cove, now in the Dennant coll. at the National Museum.—“Outline of valve subcircular, slightly longer than high; surface of valve depressed, especially near the umbo. Cardinal area as in *G. radians*, with teeth, nine on each side, slightly thicker. Exterior of valve ornamented with about 50 depressed riblets, vertically striated. Dimensions of shell from Hallett's Cove: Length, 16 mm.; height, 14.75 mm.; depth of valve, measured externally, 5 mm.

Observations.—The chief points of difference between the living *G. radians* and the present form are the depressed shape of the valve and the more numerous ribs, circ. 50 against (*sic*) circ. 40 in the living species.”

Upon application being made to Dr. H. Basedow for the loan of the type specimen, we were informed that it should be in the Tate Museum, University of Adelaide. A search in the Tate collection on our behalf by Sir Douglas Mawson proved unsuc-

cessful, so that in the absence of the type, which has never been figured, we are compelled to illustrate the species by means of an imperfect example from Marino, near Hallett's Cove, loaned to us by Dr. Basedow. In addition, we figure the shell from Hallett's Cove from which the above supplementary description was made.

In dealing with *G. striatularis* we record our belief that that species is more closely related to *G. subradians* than is *G. radians*, Lamarck sp.,<sup>16</sup> the fossil history of which is as yet unknown to us. In view of the confusion which has existed in respect to the identification of the two Lamarckian species,<sup>17</sup> it is not improbable that the Recent species with which the fossil was compared was actually *G. striatularis*, and erroneously named *radians*.

Occurrence.—Kalimnan (Lower Pliocene): holotype from Hallett's Cove, present location of type unknown (also Dennant and F.A.S. colls.); Marino (Basedow coll.); Abattoirs and Dry Creek Bores, Adelaide (W. J. Kimber coll.), South Australia. Beaumaris, Victoria (Dennant coll.). Also recorded by Basedow from Edithburg, Yorke's Peninsula, S.A.

#### GLYCYMERIS HALLI, Pritchard.

(Pl. III., Fig. 23; Pl. IV., Fig. 15.)

*Glycymeris halli*, Pritchard, 1903, Proc. Roy. Soc. Vict., Vol. XV. (N.S.), Pt. II., pp. 89-91, Pl. XIV., Figs. 10-12; Pl. XV., Figs. 1, 2, 8, 9.

Description by Pritchard, 1903: "Shell orbicular, tumid, thick and strong, equilateral, with a prominent convex umbo, and closely radially ribbed surface. Umbo incurved and overhanging the ligamental area, which is a well-defined isosceles triangular space, the base of which is just about half the width of the hinge. Hinge furnished with from 22 to 26 oblique and angular teeth, most usually 12 on each side, with a tendency for the medial ones to become obsolete in the extreme adult. Surface closely covered with broad radial ribs, ranging from about 30 to 35 in small specimens, up to about 50 in the adult, ribs slightly convex, with very narrow, almost lineal, interspaces in young shells, but in the adult the ribs are decidedly flattened; the ribs are closely, finely, and regularly radially striate, each rib bearing near the ventral margin ten striae, anteriorly and posteriorly the ribs become obsolete, but the radial striae are present, and much stronger than on the ribs. The radial sculpture is crossed by fine concentric lines of growth. Interior of valves strongly denticulate along

16.—*Pectunculus radians*, Lamarck, 1819, Anim. s. vert., Vol. VI., Pt. 1., p. 54, No. 18. Reeve, 1843, Conch. Icon., Vol. I., Pt. IX., Figs. 50a, b. Lamy, 1912, Journ. de Conch., Vol. LIX., pp. 111, 112.

17.—*cf.* Tate, 1897, Trans. Roy. Soc. S. Austr., Vol. XXI., Pt. I., p. 48. Pritchard and Gatliff, 1904, Proc. Roy. Soc. Vict., Vol. XVII. (N.S.), Pt. I., p. 244.

the ventral margin, bearing about 25 strong denticles, running about 8 to 10 in 10 mm., thence both anteriorly and posteriorly diminishing in size, but extending right up to the hinge. . . .

Dimensions.—Type, antero-posterior diameter, 42 mm.; umbo-ventral diameter, 44 mm.; thickness through one valve, 18 mm. Others range from 24 by 22, 21 by 20, 18 by 17, 17 by 16, 12 by 11, to 9 by 9 and 8 by 8, and smaller."

Observations.—Pritchard, in making a comparison with topotypes of *G. cainozoica* states (*loc. supra cit.*, p. 91. that examples of *G. halli* are "much thicker and stronger, more convex, with coarser radial ribbing, but much finer radial striations."

The greater heaviness of the shell and in particular of the hinge-line, which is more arcuate than in *G. cainozoica*, afford the easiest means of recognition of this species, the type material of which is in the private collection of Dr. G. B. Pritchard. Typical examples from MacDonald's, Muddy Creek, average 25 mm. in length, but occasional gerontic shells, one of which we figure, attain larger dimensions. The largest known to us (coll. T. S. Hall, in Cudmore coll.), measures 54.5, 54.5, and 21 mm. in length, height and thickness of valve respectively; while the corresponding dimensions of the shell here figured are 49, 48 and 18 mm.

Occurrence.—Kalimnan (Lower Pliocene): holotype from Forsyth's, Grange Burn, in Pritchard coll. (also T. S. Hall, Nat. Mus., and F.A.S. colls.); MacDonald's, Muddy Creek, plesiotype in Nat. Mus. coll., pres. R. Hughan (also Hall, F.C. and F.A.S. colls.); nodule bed between Clifton Bank and MacDonald's (F.C. coll.); Beaumaris (Dennant coll.); Jimmy's Point, Kalimna (Dennant, Hall and F.A.S. colls.); and Mallee Bores Nos. 1 (208'-210'), 2 (198'-200'), 4 (163'-170'), 5 (163'-175', 175'-189'), 6 (114'-150', 154'-158', 158'-161'), 8 (165'-180', 180'-199', 199'-204', 204'-210', 225'-226'), 9 (263'-273', 315'-325), Maryvale Bore, upper beds at Portland, and from a mixed fauna at 265' in the Paynesville Bore, Victoria (all in Nat. Mus. coll.).

*GLYCYMERIS HALLI*, var. *INTERMEDIA*, Pritchard.

*Glycymeris halli*, var. *intermedius*, Pritchard, 1903, Proc. Roy. Soc. Vict., Vol. XV. (N.S.), Pt. II., p. 90, Pl. XIV., Figs. 10, 11.

Description by Pritchard, 1903: "A variation of the above shows a less orbicular outline with sloping shoulders and consequently an apparently more prominent umbonal region, and with coarser (*sic*) radial ribbing, 25 to 28 being about the average number. . . .

Dimensions.—Var. *intermedius*, antero-posterior diameter, 21 mm., umbo-ventral diameter, 20 mm., and 19 by 19."

Observations.—Since Dr. Pritchard has given good figures of this and the succeeding variety, we have not here depicted them.



This form appears to be the commoner of the two varieties in the Muddy Creek area, but the type form (*G. halli*, *s. str.*) is far more abundant than either.

Occurrence.—Kalimnan (Lower Pliocene): type of var. from MacDonald's, Muddy Creek, in Pritchard coll.; Forsyth's, Grange Burn (T. S. Hall coll.); Beaumaris (Cudmore coll.); Jimmy's Point, Kalinna (Denuant coll.); Mallee Bores Nos. 3 (201'-220'), 5 (155'-159', 162'-163', 175'-189'), 6 (114'-150', 154'-158', 158'-161'), 8 (165'-180', 199'-204', 204'-2108'), 9 (254'-273', 315'-325'), 10 (254'-296') (Nat. Mus. coll.), Victoria.

GLYCYMERIS HALLI, var. PAUCICOSTATA, Pritchard.

*Glycymeris halli*, var. *paucicostatus*, Pritchard, 1903, Proc. Roy. Soc. Vict., Vol. XV. (N.S.), Pt. II., p. 90, Pl. XIV., Fig. 12; Pl. XV., Fig. 9.

Description by Pritchard, 1903: Another form which appears but a variation of the above species, is intermediate in shape between it and the foregoing variety, but rather closer related to the latter, being distinguished most readily by the coarser radial ribbing, as it bears only about 20 strong, convex ribs, neglecting the obscure and ill-defined ones on the anterior and posterior slopes.

Dimensions.—Var. *paucicostatus*, antero-posterior diameter, 22 mm.; umbo-ventral diameter, 21 mm.; others range about 18 by 17, and 15 by 14.5."

Observations.—This variant is apparently the rarest of the three forms, although, as remarked by Pritchard, it is not uncommon at the type section of the Kalimnan at Jimmy's Point, Gippsland Lakes.

Occurrence.—Kalimnan (Lower Pliocene): type of var. from Jimmy's Point, Kalinna, near Lakes Entrance, in Pritchard coll. (also Denuant and F.A.S. colls.); Forsyth's, Grange Burn (T. S. Hall coll.); Mallee Bore No. 8, 165'-180' (Nat. Mus. coll.), Victoria.

GLYCYMERIS DECURRENS, sp. nov.

(Pl. III., Figs. 24a, 24b, 25a, 25b; Pl. IV., Fig. 16.)

Description of Holotype.—Right valve of an adult specimen; subtrigonal in outline, moderately depressed; ventral border angularly rounded; dorsal line short. Umbo minute, prominent and acute, distinctly opisthogyrate. Surface evenly rounded except towards the posterior margin, where it becomes distinctly flattened. Costae about 31, evenly radiate, depressed and slightly rounded, with linear interspaces; lines of growth well marked, increasing towards the ventral border; growth stages rather numerous, about 9 in the holotype. Hinge area moderately deep, angularly arched; teeth fairly strong, about 13 on each side. Denticulae of inner margin well marked and excavate opposite to the external costae.

Dimensions of Holotype.—Length (ant.-post.), 22.5 mm.; height, 23 mm.; thickness of valve, 6.5 mm.

Description of Paratype.—This is a left valve of an ephelic example, which differs from the holotype in its more rounded outline, less arched dorsal margin, less prominent umbo, and somewhat flatter valve. The costae, about 29 in number, are similar to those of the holotype, while the distinctness of the growth stages is also common to both.

Dimensions of Paratype.—Length (ant.-post.), 18.5 mm.; height, 17.25 mm.; thickness of valve, 4 mm.

Observations.—This Kalimnan form has long been referred to *G. subtrigonalis*, Tate sp., and it is only after full consideration that we accord to it specific rather than varietal rank. The present species differs from *G. subtrigonalis*, however, in the greater depression of the shell: the flattening of the ribs, which become almost obsolete towards the umbo; and the finer interspaces, which are practically linear, as opposed to those of *G. subtrigonalis*, in which the intercostal spacing is well marked and even sulcate.

Of living species *G. sordida*, Tate sp.,<sup>18</sup> of the southern coasts of Australia bears the most resemblance, but is readily distinguished from *G. decurrens* by its fewer ribs (20 as against 31 in the respective holotypes), and characteristic stepping of the shell surface due to rest-periods during growth.

Occurrence.—Kalimnan (Lower Pliocene): Forsyth's, Grange Burn, near Hamilton, Victoria, holotype pres. to Nat. Mus. by F. A. Singleton, paratype coll. and pres. by F. Chapman (also T. S. Hall coll.); Jimmy's Point, Kalimna (Dennant coll.), Victoria.

GLYCYMERIS PLANIUSCULA, sp. nov.

(Pl. III., Figs. 26, 27, 28; Pl. IV., Figs. 17, 18.)

*Pectunculus planiusculus*, Tate MS., in Dennant, 1887, Trans. Roy. Soc. Vict., Vol. XXIII., p. 237 (list name).

Description of Holotype.—Right valve of a medium-sized specimen; sub-circular in outline, depressed; ventral border evenly rounded; dorsal line straight and extensive, longer on the anterior side; anterior margin less evenly rounded than posterior, the latter being circularly convex from the ventral to the post-dorsal angle. Umbo minute, acute and slightly opisthogyrate. General surface depressed gently and evenly on the ventro-dorsal axis; flattened at the anterior and posterior regions. Costae about 34, rounded and rather depressed, with linear interspaces, and crossed by fine thread-like lines of growth; the ribs on the anterior are rounder and more definite than those on the posterior. This speci-

18.—*Pectunculus sordidus*, Tate, 1891, Trans. Roy. Soc. S. Austr., Vol. XIV., p. 264, Pl. XI., Fig. 8. *Glycymeris sordidus*, Tate, Verco, 1907, *ibid.*, Vol. XXXI., pp. 227, 228.

men shows about five growth stages marked by deeper concentric lines. Hinge area comparatively deep and flat, the entire internal margin having a strongly planated character. Teeth strong, oblique, numbering about 8 on each side. Inner marginal denticulate and excavate in opposiiton to the external costae.

Dimensions of Holotype.—Length (ant.-post.), 19.5 mm.; height, 16.5 mm.; thickness of valve, 3 mm.

Since the preservation of the holotype is not quite perfect, we may amplify the above description by means of other and better specimens from the Kalimnan beds of the Upper Muddy Creek Series, one of which we select as a paratype.

Description of Paratype.—This is a left valve which shows the following additional features:—Costation at post-cardinal angle rather more widely spaced than anteriorly. Ligamental area small, striated.

Dimensions of 1st Paratype.—Length (ant.-post.), 11.5 mm.; height, 11 mm.; thickness of valve, 2 mm.

Description of Gerontic Form (Paratype).—Valve roundly oval, longest diameter dorso-ventral. Costæ about 32, rounded and depressed. Cardinal area typically flat, with 8 teeth on each side. Striated ligamental area limited and small.

Dimensions of 2nd Paratype.—Length, 32.5 mm.; height, 34 mm.; thickness of valve, 6.5 mm.

Observations.—This species name has been known since 1887, when Mr. Dennant introduced it as a MS. name of Prof. Tate's into a list of fossils from the Glenelg River. In the Dennant coll. now in the National Museum are three examples to which Tate's MS. name has been attached, one of which, the most typical, we select as holotype. Of the remaining two specimens, one is a neanic form, somewhat damaged, whilst the other is a gerontic form, of somewhat aberrant character in its accentuated height along the dorso-ventral axis.

It may be noted that the specimen recorded by Chapman and Gabriel<sup>19</sup> from the Mallee Bore No. 6, 158'-161', as *G. maccoyi*, is now referred by us to the above species.

The characteristic planation of the internal margin is a character shared by the Recent *G. vitrea*, Lamarck sp.<sup>20</sup>, of the Queensland coast, a species which is similar in outline but differs in the greater number of ribs (40 as against 34) in the living form, while the surface ornament is entirely different.

Occurrence.—Kalimnan (Lower Pliocene): paratype (coll. and pres. to Nat. Mus. by F. Chapman) and other specimens from Forsyth's, Grange Burn (also T. S. Hall and F.A.S. colls.); from the same horizon at MacDonald's, Muddy Creek, near Hamilton (F.C. coll.); Mallee Bore No. 6, 158'-161' (Nat. Mus. coll.), Victoria.

19.—Proc. Roy. Soc. Viet., Vol. XXVI. (N.S.), Pt. II., 1914, p. 304.

20.—*Pectunculus vitreus*, Lamarck, 1819, Anim. s. vert., Vol. VI., Pt. I., p. 54. Reeve, 1843, Conch. Icon., Vol. I., Pl. VIII., Figs. 45a,b. Lamy, 1912, Journ. de Conch., Vol. LIX., pp. 94, 95.

Werrikooian (Upper Pliocene): holotype and paratype (gerontic form), from Limestone Creek, Glenelg River, Victoria, in Dennant coll., Nat. Museum (also F.A.S. coll.).

GLYCYMERIS FLABELLATA, T. Woods sp.

(Pl. III., Figs. 29a, 29b, 30; Pl. IV., Figs. 19, 20.)

*Pectunculus flabellatus*, T. Woods, 1878, Trans. Roy. Soc. Vict., Vol. XIV., pp. 61, 62. Harris, 1897, Cat. Tert. Moll. Brit. Mus., Pt. I., Australasia, p. 342.

*Glycymeris flabellatus*, T. Woods sp., Pritchard and Gatliff, 1904, Proc. Roy. Soc. Vict., Vol. XVII. (N.S.), Pt. I., pp. 242, 243. Gatliff and Gabriel, 1908, Proc. Roy. Soc., Vict., Vol. XXI. (N.S.), Pt. I., p. 391.

*Glycymeris pectinoides*, Deshayes, Verco, 1907, Trans. Roy. Soc. S. Austr., Vol. XXXI., pp. 226, 227, Pl. XXVIII., Fig. 4 (*non* Deshayes).

Description by T. Woods, 1878: "Shell broadly orbicular, but slightly transverse, thick, somewhat tumid, validly radiately ribbed; ribs 25 to 35, broad, flattened, becoming very close at the sides as the shell grows; margins broadly toothed; cardinal teeth 16 to 20, white; colour white stained, but intense fulvous brown within; and more or clouded and spotted with the same colour on the outside.

Long. 44, Lat. 47, Alt. 44."

Description of Neotype.—A left valve, subcircular, solid, and moderately inflated, with inconspicuous umbo. Surface ornamented with 24 broad, rounded and somewhat flattened ribs, with almost linear interspaces. Concentric ornament ill-defined, consisting of fine liræ; growth stages well marked, about seven in number. Hinge-line regularly arched, with eight straight teeth in each of anterior and posterior series. Ligament area narrow, with 4 and 5 striae respectively in a space of 1.5 mm.

Dimensions of Neotype.—Length (ant.-post.), 37 mm.; height, 34 mm.; thickness of valve, 10 mm.

Description of Plesiotype.—The fossil specimen here figured differs from the Recent neotype in having a more ovate outline, being higher than long, in which character, however, the fossil shell can be matched among Recent examples. The ribs number about 23, and the other shell characters are similar to those of the neotype.

Dimensions of Plesiotype.—Length, (ant.-post.), 36 mm.; height, 37 mm.; thickness of valve, 9.5 mm.

Note on T. Woods' Type.—Tenison Woods (*loc. cit.*) gives the distribution as "Victoria and Tasmania," and the specimen on which he based his original description should be in the collections of the National Museum, Melbourne, but so far we have been unable to identify it from the dimensions given.

We have, therefore, selected as neotype one of a pair of valves from N.E. Tasmania in the Nat. Mus. coll. The label is dated 1877, and the tablet is believed to be one of those examined and named by T. Woods at the time of writing of his paper.

Observations.—This Recent species found off the south-eastern coasts of Australia shows considerable variation in outline, degree of inflation and character of the radial and concentric ornament, all of which features have been fully dealt with by Verco (*loc. supra cit.*). It is noteworthy that the fossil shells agree with the neotype here selected in having narrow interspaces and poorly developed concentric ornament, as contrasted with the variant having deeply furrowed interspaces and squamose concentric ornament, which is not uncommon in South Australian waters. This latter form is frequently decidedly inequilateral in addition; nevertheless we agree with Verco in believing that the lack of fixity of these characters precludes the erection of varietal distinctions.

Occurrence.—Werrikooian (Upper Pliocene): Glenelg River near Limestone Creek, Western Victoria, plesiotype and other examples in Dennant coll., Nat. Mus.; also F.A.S. coll.

Recent: somewhat uncommon in Victorian, Tasmanian and South Australian waters.

GLYCYMERIS STRIATULARIS, Lamarck sp.

(Pl. III., Fig. 31; Pl. IV., Fig. 21.)

*Pectunculus striatularis*, Lamarck, 1819, *Anim. s. vert.*, Vol. VI., Pt. I., p. 52, No. 13. Lamy, 1912, *Journ. de Conch.*, Vol. LIX., pp. 112-14, Pl. II., Figs. 1, 2.

*Pectunculus obliquus*, Reeve, 1843, *Conch. Icon.*, Vol. I., Pl. VI., Fig. 33.

*Glycymeris striatularis*, Lamarck, Pritchard and Gatliff, 1904, *Proc. Roy. Soc. Vict.*, Vol. XVII. (N.S.), Pt. 1., p. 244. *Idem, ibid.*, 1906, Vol. XVIII. (N.S.), Pt. II., p. 68.

Description of Plesiotype.—Right valve of an ephelic example, subovate, moderately inflated, with minute but conspicuous umbo. Shell surface marked with numerous depressed radial ribs, about 25 in the median area, where they are separated merely by shallow linear sulci, but gradually disappearing anteriorly and posteriorly. Each rib carries about 8 longitudinal striae, partially interrupted by the concentric growth lines but persisting as fine radii on either margin, where the costae have become obsolete; growth stages numerous but ill-defined. Hinge area gently arcuate; teeth 13 and 12 in anterior and posterior series, slightly uncinately centrally but becoming more linear marginally; ligamental area with about 3 striae in a space of 1.8 mm. Inner ventral margin with about 37 denticulae, which become smaller and ultimately vanish anteriorly and posteriorly.

Dimensions of Plesiotype.—Length (ant.-post.), 34 mm.; height, 31 mm.; thickness of valve, 9.5 mm.

Observations.—In his original description of the shell beds of the Glenelg River near the junction of Limestone Creek, in South-Western Victoria, Dennant<sup>21</sup> listed on Tate's determination *Pectunculus obliquus*, Reeve, now a synonym of *G. striatularis*, Lamarck sp., to which we refer the common species of *Glycymeris* in these Werrikoonian deposits. At a later date he listed<sup>22</sup> the form under the name of *G. radians*, Lamarck, a species which has suffered much confusion with *G. striatularis*. An examination of the examples from Limestone Creek in the Dennant coll., now in the National Museum, induces us to refer all but one to *G. striatularis*, of which a large series has recently been obtained by one of us (F.A.S.) from the Werrikoonian shell-beds of the Glenelg River. The solitary exception is regarded by us as a worn example of *G. tenuicostata*, Reeve sp.

These Werrikoonian examples of *G. striatularis* agree well with the Recent shells as found along the southern coasts of Australia. A related fossil form is that described as *G. subradians*, which appears to be closer to the present species, *G. striatularis*, than to the Recent *G. radians*.

Occurrence.—Kalimnan (Lower Pliocene): Beaumaris, V., and Abattoirs Bore, S.A., F. A. Cudmore coll. (*G. cf. striatularis*. At both localities).

Werrikoonian (Upper Pliocene): Glenelg River near Limestone Creek, Victoria, plesiotype in Dennant coll., Nat. Mus.; also T. S. Hall (pres. E. B. Brown), and F.A.S. colls.

Post-Tertiary: Outer Harbour, Adelaide, South Australia (F.A.S. coll., pres. W. J. Kimber).

Recent: common along southern coastline of Australia from Western Australia to Victoria; also Tasmania.

GLYCYMERIS AUSTRALIS, Quoy and Gaimard sp.,  
var. GIGANTEA, Chapman.

(Pl. III., Fig. 32; Pl. IV., Fig 22.)

*Glycymeris australis*, Quoy and Gaimard sp., var. *gigantea*,  
Chapman, 1915, Geol. Surv. S. Austr., Bull. No. 4,  
p. 49.

Description by Chapman, 1915: "The outline of the shell is sub-orbicular to suboval, and longer than deep. The faint radial ornament links it up with *G. radians*, Lam. sp., but in its general characters, and especially in its concentric folds, it agrees with *G. australis*, excepting that the size and thickness of the valves are much greater than in the living species. The concentric lines of growth, moreover, are in this variety strongly developed near the

21.—Dennant, 1887, Trans. Roy. Soc. Vict., Vol. XXIII., p. 237.

22.—Dennant and Kitson, 1903, Rec. Geol. Surv. Vict., Vol. I., Pt. II., p. 146.

ventral border, where they form distinct rugæ. The form of the valve in being longer than high is like that of other Australian species, thus differing from *G. laticostatus*, Q. and G., which shell it resembles in its massive character. The fractured shell shows a thickness of 5 mm. in several instances."

Observations.—This variety of the Recent *G. australis*, Q. and G. sp.,<sup>23</sup> was founded on some more or less fragmentary shells obtained by Dr. Arthur Wade at Kangaroo Island, and we take the opportunity of furnishing a figure of the type of the variety, and of making some additional observations upon it. It is worthy of note that this form does not occur in the large and typical series of Werrikoonian fossils from the Glenelg River made by Mr. Dennant, and now in the National Museum.

On account of certain aberrant features of the type specimen, notably in the distinctly rugose character of the shell-surface, we have re-examined it in conjunction with Mr. C. J. Gabriel, and furnish the following remarks:—

Notes on the Holotype.—This is a left valve in the gerontic stage. The outline is markedly equilateral, and in the earlier stages longer than high, but in the present gerontic form this relation appears to be reversed. The umbo is relatively minute and opisthogyrate. Decortication of the external rugose layer results in the display of faint radial lineations, and in a few places there are indications of a finely undulose growing edge. The interior is filled by the hard and resistant matrix, by which the hinge characters are largely masked, but so far as seen they are in accord with *Glycymeris*. The thickness of the shell in the type example is considerably less than the 5 mm. indicated in the original diagnosis, and does not exceed 2.5 mm. The approximate dimensions of the imperfect shell are:—Length (ant.-post.), 72 mm. (restored); height, 85 mm.; thickness of valve, *circa* 24 mm.

Occurrence.—Werrikoonian (Upper Pliocene): Vivonne Bay, Kangaroo Island, South Australia, holotype of variety, coll. Dr. Wade, in the National Museum, Melbourne.

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23.—*Pectunculus australis*, Quoy and Gaimard, 1835, Voy. Astrolabe, Vol. III., pp. 469, 470, Pl. LXXVII., Figs. 7-9.

RANGE IN TIME OF SPECIES

	Balcombian (Oligocene)	Janjukian (Miocene)	Kalimanan (L. Pliocene)	Werrikooian (U. Pliocene)	Post-Tertiary	Recent
"Ainea" group -	..	maudensis.				
	cainozoica	cainozoica.				
	..	..	halli	australis gigantea	..	australis.
			halli intermedia.			
			halli paucicostata.			
"laticostata" group -	..	..	striatularis (?)	striatularis	striatularis	striatularis.
	..	..	subradians	..	..	radians.
	..	tenuicostata	tenuicostata	tenuicostata	..	tenuicostata.
	..	ornithopetra	..	..	..	laticostata (N.Z.).
	..	maccoyi.				
	..	lenticularis	planiuscula	planiuscula.		
	gunyoungensis	gunyoungensis.				
	..	subtrigonalis	decurrens	..	..	sordida.
	..	convexa (?)	convexa	flabellata	..	flabellata.



## SYNOPSIS OF SPECIFIC CHARACTERS.

	Shape of Valve.	Profile.	Umbo	Costation.	Growth Lines.	Growth Stages.	Inner Dorsal Region.	Inner Ventral Region.
<i>G. catinozeica</i>	roundly trigonal to subcircular; oblique in gerontic stage	strongly convex	prominent; acute, incurved	faint radii	concentric striae	numerous, not strongly marked	ligament area moderately broad, 6-8 striae; hinge line arched, teeth 8:7 ephebic, 13:12 gerontic	finely denticulate; margin defined, not extensive
<i>G. mandensis</i>	subtrigonal	moderately convex	subacute, prominent	striate; obsolescent towards ventral border	fine	inconspicuous	ligament area arcuate; teeth 9:8	strongly denticulate
<i>G. halli</i>	circular	strongly convex dorsally; depressed ventrally	large, incurved	ribs broad, radially striate, 30-50, interspaces sublinear	fine concentric lines	few and indistinct	ligament area moderately long, about 8 striae; teeth circ. 12:12.	edge thick, denticulate
<i>G. halli intermedia</i>	subcircular; marked umbonal truncation	ditto	ditto	ribs 25-28	ditto	ditto	ligament area short, about 6 striae; teeth circ. 10:10	ditto
<i>G. halli paucicostata</i>	subcircular	ditto	smaller than in sp. type; incurved	strong convex ribs, narrow interspaces.	fine undulate striae	ditto	ligament area short, about 4 striae	ditto

SYNOPSIS OF SPECIFIC CHARACTERS--(Continued).

	Shape of Valve.	Profile.	Umbo.	Costation.	Growth Lines.	Growth Stages.	Inner Dorsal Region.	Inner Ventral Region.
<i>G. australis</i>	subcircular to subovate, transverse	convex at umbo	small, incurved	about 34 depressed ribs, finely striate, with fine linear interspaces	fine, almost obsolete	few, indistinct	ligament moderately long, low, pr act i cally non-striate	edge flatly rounded, with fine denticulae.
<i>G. australis gigantea</i>	ditto	evenly convex	ditto	striate	distinct, well-developed at ventral margin.	ditto	ditto	_____
<i>G. striatularis</i>	subovate	moderately convex at umbo	small, acute	about 25 depressed ribs in median area; finely striate	fine	numerous, indistinct	ligament small, striae few; teeth circ. 13:12.	finely denticulate
<i>G. subadians</i>	subcircular, slightly transverse	moderately convex	small	50 depressed striated ribs	fine, almost obsolete	few and indistinct	ligament short and low; hinge line short; teeth circ. 7:7	feebly denticulate
<i>G. tenuicostata</i>	subcircular	depressed convex	subacute	about 40 ribs, alternately large and small	fine numerous, beaded	few, inconspicuous	ligament narrow; teeth circ. 12:11	strongly denticulate

## SYNOPSIS OF SPECIFIC CHARACTERS—(Continued).

	Shape of Valve.	Profile.	Umbo.	Costation.	Growth Lines.	Growth Stages.	Inner Dorsal Region.	Inner Ventral Region.
<i>G. ornithopetra</i>	subcircular in neanic and ephelic stages; in gerontic irregularly subovate, longer axis dorso-ventral	strongly convex and deep at umbo	comparatively small	40 subangular to rounded ribs; interspaces well-defined and 1/3 of a rib.	very fine, interradially as squamose laminae	numerous, well-marked, by deeper lines crossing entire surface as undulate laminae	ligament short and high, 10 striae; teeth 8:8 in type	area subplanate, elevated denticulae in type
<i>G. maccoyi</i>	subcircular; subangulate on border in gerontic stage	moderately to depressed convex	inconspicuous	29-31 convex ribs; interspaces narrow	fine concentric laminae	fairly numerous but indistinct	ligament long and low, 8 striae; hinge line moderately long; teeth 8:8 in type	area planate, with 20 denticulae in type
<i>G. lenticularis</i>	circular, slightly transverse	depressed convex	small, acute	40-50 rounded ribs, with interspaces of equal width to ribs	fine concentric undulae	fairly numerous, indistinct	ligament area very small; teeth 11:11	area narrowly denticulate
<i>G. gunyungensis</i>	subcircular; subtruncated dorsally	depressed convex	inconspicuous	about 33 rounded ribs; interspaces narrow	distinct and closely concentric	rare; not very distinct	ligament narrow, 4 striae; hinge line arched; teeth 11:10 in type	area margin narrow, distinctly denticulate ventrally, but evanescent towards dorsal region

SYNOPSIS OF SPECIFIC CHARACTERS—(Continued).

	Shape of Valve.	Profile.	Umbo.	Costation.	Growth Lines.	Growth Stages.	Inner Dorsal Region.	Inner Ventral Region.
<i>G. subtrigonalis</i>	subtrigonal, oblique	depressed convex	small, inconspicuous	about 29 rounded ribs; interspaces narrower but well-marked	subimbricate lamellae	few, but distinct	area short, with about 5 striae; hinge line very short, teeth in arched series, about 10:10	strongly crenate
<i>G. decurrens</i>	circular to subtrigonal	depressed convex	small, acute	29-31 depressed ribs with fine interspaces, becoming almost obsolete near umbo	lamellae emphasized at growth stages and towards ventral border	fairly numerous; well-marked	area short, about 6 striae; cardinal series arched, teeth 13:11 in type	outer edges irregularly flat; denticulations well-marked
<i>G. planiuscula</i>	subcircular; higher than long in gerontic stage	much depressed	small, acute	about 34 depressed ribs with linear interspaces	fine, thread-like	few, inconspicuous	area small, striae few	edge flat and broad, with faint denticulae
<i>G. convexa</i>	circular, slightly transverse	deeply convex at umbos; more depressed near ventral region	small, acute	24 elevated ribs, narrower than interspaces	thick, concentric laminae, finer at anterior	few, but usually well-marked	area long and low, about 5 striae; teeth in arched series, about 10:10.	inner edge plane, with coarse denticulae
<i>G. fiabellata</i>	subcircular	moderately convex	small, inconspicuous	about 25 rounded ribs with sulcate interspaces	fine wavy laminae	few, well-marked	area moderately long and low, about 3 striae; cardinal series arched, teeth 8:8	edge flat, with coarse denticulae

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## EXPLANATION OF PLATES.

### PLATE I.

Fig. 1.—*Glycymeris cainozoica*, T. Woods sp. Janjukian. Table Capé. Holotype. Tasmanian Museum, Hobart. (a) exterior; (b) interior. Slightly enlarged.

- Fig. 2.—*G. cainozoica*, T. Woods sp. Janjukian. Table Cape. Paratype. Tas. Mus., Hobart. (a) exterior; (b) interior. Slightly enlarged.
- Fig. 3.—*G. cainozoica*, T. Woods sp. Balcombian. Muddy Creek, lower beds. Plesiotype. Tate Coll., Adelaide University Geol. Dept. Original of Tate's figure. Nat. size.
- Fig. 4.—*G. cainozoica*, T. Woods sp. Balcombian. Muddy Creek, lower beds. Plesiotype. Tate Coll., Adelaide University. Shell on left of Tate's figured specimen. Nat. size.
- Fig. 5.—*G. gunyoungensis*, sp. nov. Balcombian. Grice's Creek, Port Phillip. Holotype. National Museum, Melbourne; coll. W. Kershaw. (a) exterior, slightly enlarged; (b) interior, circ. nat. size. [13324.]<sup>24</sup>
- Fig. 6.—*G. gunyoungensis*, sp. nov. Balcombian. Grice's Creek. Paratype. Nat. Mus.; coll. W. Kershaw. Slightly reduced. [13325.]
- Fig. 7.—*G. maccoyi*, Johnston sp. Janjukian. Table Cape. Neotype. Nat. Mus.; coll. and pres. F. A. Cudmore, (a) exterior; (b) interior. Circ. nat. size. [13326.]
- Fig. 8.—*G. lenticularis*, Tate sp. Janjukian. Adelaide Bore. Cotypes. Tate Coll., Adelaide University. (a) right valve; (b) left valve. Nat. size.

## PLATE II.

- Fig. 9.—*Glycymeris oruithopetra*, sp. nov. Janjukian. Bird Rock Cliffs, Torquay. Holotype. Geol. Surv. Vict. Coll., Nat. Mus.; coll. R. Daintree. (a) exterior; (b) interior. Circ. nat. size. [12465.]
- Fig. 10.—*G. subtrigonalis*, Tate sp. Janjukian. Murray River, near Morgan. Holotype. Tate Coll., Adelaide University. Nat. size.
- Fig. 11.—*G. subtrigonalis*, Tate sp. Janjukian. Murray River, near Morgan. Plesiotype. Tate Coll., Adelaide University. Shell on left of Tate's figured specimen (holotype). Nat. size.
- Fig. 12.—*G. subtrigonalis*, Tate sp. Janjukian. Murray River, four miles below Morgan. Plesiotype. Nat. Mus.; coll. and pres. F. A. Cudmore. Internal aspect. Circ. nat. size. [13327.]
- Fig. 13.—*G. maudensis*, sp. nov. Janjukian. Maude, lower beds. Holotype. Dennant Coll., Nat. Mus. (a) exterior, circ. nat. size; (b) interior, slightly reduced. [13328.]
- Fig. 14.—*G. tenuicostata*, Reeve sp. Janjukian. Skinner's, Mitchell River. Plesiotype. Dennant Coll., Nat. Mus. Circ. nat. size. [13329.]

24.—This and succeeding numbers in brackets refer to registered specimens in the National Museum.



- Fig. 15.—*G. tenuicostata*, Reeve sp. Werrikoonian. Glenelg River, above Limestone Creek. Plesiotype. Nat. Mus.; coll. and pres. F. A. Singleton. (a) exterior; (b) interior. Slightly reduced. [13330.]
- Fig. 16.—*G. convexa*, Tate sp. Kalimnan. Muddy Creek, upper beds. Holotype. Tate Coll., Adelaide University. (a) external aspect; (b) umbonal aspect. Circ. nat. size.
- Fig. 17.—*G. convexa*, Tate sp. Kalimnan. Muddy Creek, upper beds. Plesiotype. Tate Coll., Adelaide University. Umbonal aspect of shell on left of Tate's figured specimen (holotype). Circ. nat. size.
- Fig. 18.—*G. convexa*, Tate sp. Kalimnan. Muddy Creek, upper beds. Plesiotype. Tate Coll., Adelaide University. Internal aspect of shell on right of Tate's figured specimen. Circ. nat. size.
- Fig. 19.—*G. convexa*, Tate sp. Kalimnan. Muddy Creek, upper beds. Plesiotype. Tate Coll., Adelaide University. Neanic example, below Tate's figured specimen. Circ. nat. size.
- Fig. 20.—*G. convexa*, Tate sp. Kalimnan. MacDonald's, Muddy Creek. Plesiotype. Nat. Mus.; coll. and pres. F. Chapman. Neanic example, figured by Chapman and Gabriel as *G. maccayi*. Nat. size. [12467.]

## PLATE III.

- Fig. 21.—*Glycymeris subradians*, Tate. Kalimnan. Marino, near Hallett's Cove. Plesiotype. Private coll. of Dr. H. Basedow, Adelaide. Circ. nat. size.
- Fig. 22.—*G. subradians*, Tate. Kalimnan. Hallett's Cove. Plesiotype. Dennant Coll., Nat. Mus. Circ. nat. size. [13331.]
- Fig. 23.—*G. halli*, Pritchard. Kalimnan. MacDonald's, Muddy Creek. Plesiotype. Nat. Mus. Coll.; pres. R. Hughan. Slightly reduced. [7842.]
- Fig. 24.—*G. decurrens*, sp. nov. Kalimnan. Forsyth's, Grange Buru. Holotype. Nat. Mus. Coll.; pres. F. A. Singleton. (a) exterior; (b) interior. Circ. nat. size. [13332.]
- Fig. 25.—*G. decurrens*, sp. nov. Kalimnan. Forsyth's, Grange Buru. Paratype. Nat. Mus.; coll. and pres. F. Chapman. (a) exterior; (b) interior. Slightly reduced. [13333.]
- Fig. 26.—*G. planiuscula*, sp. nov. Werrikoonian. Limestone Creek, Glenelg River. Holotype. Dennant Coll., Nat. Mus. Slightly enlarged. [13334.]
- Fig. 27.—*G. planiuscula*, sp. nov. Werrikoonian. Limestone Creek, Glenelg River. Paratype. Dennant Coll., Nat. Mus. Circ. nat. size. [13335.]

- Fig. 28.—*G. planiuscula*, sp. nov. Kalimnan. Forsyth's, Grange Burn. Paratype. Nat. Mus.; coll. and pres. F. Chapman. Circ. nat. size. [13336.]
- Fig. 29.—*G. flabellata*, T. Woods sp. Recent. N.E. Tasmania. Neotype. Nat. Mus. Coll. (a) exterior; (b) interior. Slightly reduced. [36805.]
- Fig. 30.—*G. flabellata*, T. Woods sp. Werrikoonian. Limestone Creek, Glenelg River. Plesiotype. Dennant Coll., Nat. Mus. Circ. nat. size. [13337.]
- Fig. 31.—*G. striatularis*, Lamarck sp. Werrikoonian. Limestone Creek, Glenelg River. Plesiotype. Dennant Coll., Nat. Mus. Circ. nat. size. [13338.]
- Fig. 32.—*G. australis*, Quoy and Gaimard sp., var. *gigantea*, Chapman. Werrikoonian. Vivonne Bay, Kangaroo Is. Holotype of variety. Nat. Mus.; coll. Dr. A. Wade. Slightly reduced. [13339.]

PLATE IV.

*Umbono-Ventral Profiles drawn to Natural Size.*

- Fig. 1.—*Glycymeris cainozoica*, T. Woods sp. Holotype. (Pl. I., Fig. 1.)
- Fig. 2.—*G. cainozoica*, T. Woods sp. Plesiotype. (Pl. I., Fig. 3.)
- Fig. 3.—*G. cainozoica*, T. Woods sp. Plesiotype. (Pl. I., Fig. 4.)
- Fig. 4.—*G. gunyoungensis*, sp. nov. Holotype. (Pl. I., Fig. 5.)
- Fig. 5.—*G. maccoyi*, Johnston sp. Neotype. (Pl. I., Fig. 7.)
- Fig. 6.—*G. lenticularis*, Tate sp. Cotype. (Pl. I., Fig. 8.)
- Fig. 7.—*G. ornithopetra*, sp. nov. Holotype. (Pl. II., Fig. 9.)
- Fig. 8.—*G. subtrigonalis*, Tate sp. Holotype. (Pl. II., Fig. 10.)
- Fig. 9.—*G. maudensis*, sp. nov. Holotype. (Pl. II., Fig. 13.)
- Fig. 10.—*G. tenuicostata*, Reeve sp. Plesiotype. (Pl. II., Fig. 14.)
- Fig. 11.—*G. tenuicostata*, Reeve sp. Plesiotype. (Pl. II., Fig. 15.)
- Fig. 12.—*G. convexa*, Tate sp. Holotype. (Pl. II., Fig. 16.)
- Fig. 13.—*G. convexa*, Tate sp. Plesiotype. (Pl. II., Fig. 17.)
- Fig. 14.—*G. subradians*, Tate. Plesiotype. (Pl. III., Fig. 21.)
- Fig. 15.—*G. halli*, Pritchard. Plesiotype. (Pl. III., Fig. 23.)
- Fig. 16.—*G. decurrens*, sp. nov. Holotype. (Pl. III., Fig. 24.)
- Fig. 17.—*G. planiuscula*, sp. nov. Holotype. (Pl. III., Fig. 26.)
- Fig. 18.—*G. planiuscula*, sp. nov. Paratype. (Pl. III., Fig. 27.)
- Fig. 19.—*G. flabellata*, T. Woods sp. Neotype. (Pl. III., Fig. 29.)
- Fig. 20.—*G. flabellata*, T. Woods sp. Plesiotype. (Pl. III., Fig. 30.)
- Fig. 21.—*G. striatularis*, Lamarck sp. Plesiotype. (Pl. III., Fig. 31.)
- Fig. 22.—*G. australis*, Quoy and Gaimard sp., var. *gigantea*, Chapman. Holotype of variety. (Pl. III., Fig. 32.)

ADDENDUM.—Since the above was written, Iredale (Proc. Linn. Soc. N.S. Wales. Vol. XLIX., Pt. III., 1924, p. 187) has advised the rejection of *P. australis*, Q. and G., on the ground of preoccupation by Morton (Synops. Org. Remains Cret. Group, U.S., 1834, p. 64), whose name he suspects to have appeared earlier in the year than that of Quoy and Gaimard. Were the evidence not more definite than this, we should hesitate to abandon this well-known name for the Australian shell, but examination of the dates of publication of the various sections of the Zoology of the "Voyage d'Astrolabe" discloses an interesting problem. The Atlas in which our shell is figured bears the date 1833, but the name given is in a vernacular form (*Pétoncle austral*) of Quoy and Gaimard's intended name of the species. The conchological section constitutes Vol. III. of the Zoology, and appeared in two parts; the first (pp. 1-368) in 1834, and the second (pp. 359-954), which includes the diagnosis of our species, in 1835. If the latter date be taken, then Morton's name has clear priority, but if the readily identifiable figures are accepted, despite the form of the accompanying legend, then the reverse is the case; we therefore leave the matter open. F.C. and F.A.S., 9.3.25.